Downloaded from orbit.dtu.dk on: May 04, 2023

DTU Library

The breakeven price of REDD-credits: a case study from Kade, Ghana

Kongsager, Rico

Publication date:
2012

Document Version
Publisher's PDF, also known as Version of record

Link back to DTU Orbit

Citation (APA):
Kongsager, R. (Author). (2012). The breakeven price of REDD-credits: a case study from Kade, Ghana. Sound/Visual production (digital)

General rights
Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

The breakeven price of REDD-credits: a case study from Kade, Ghana

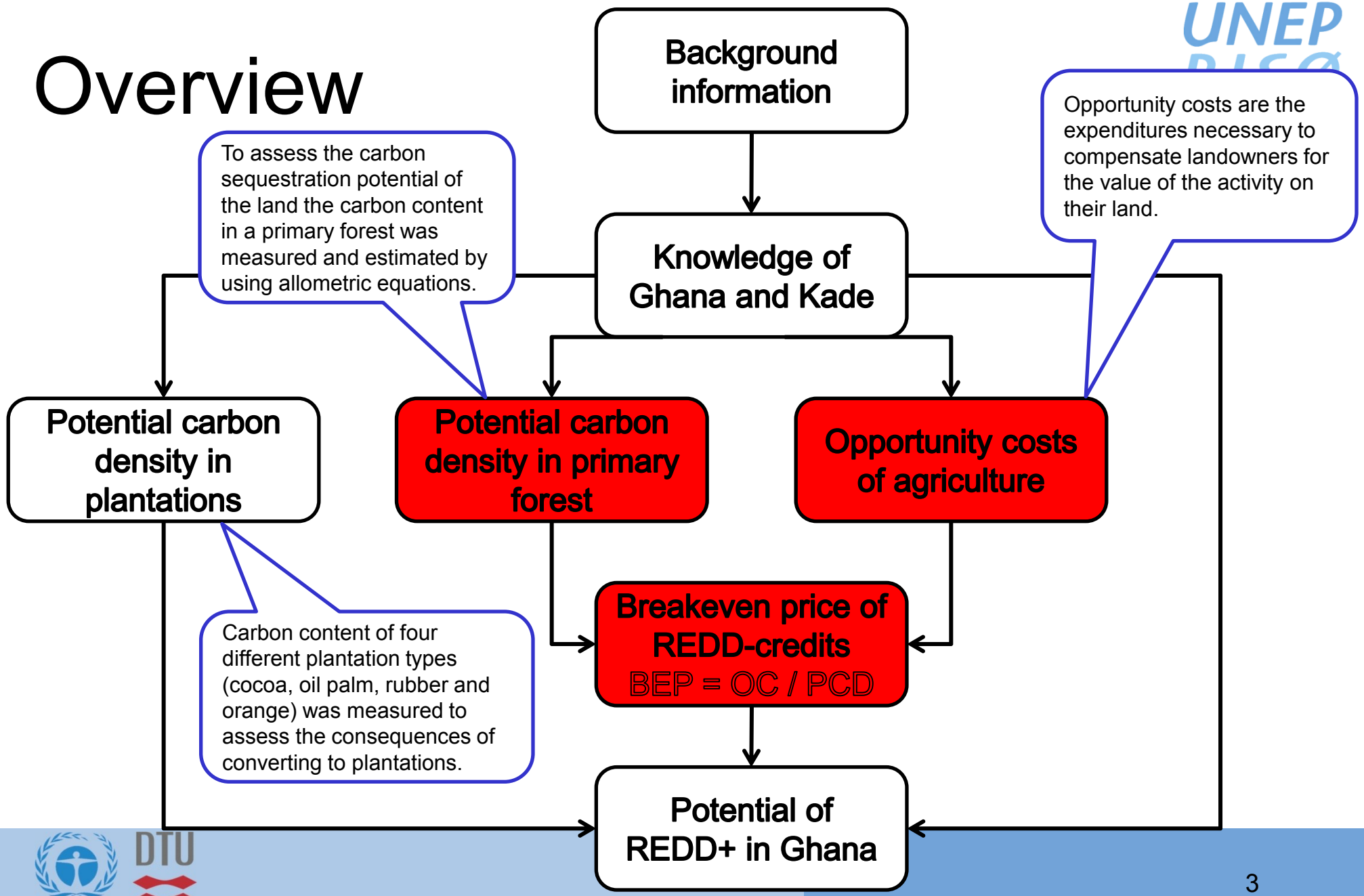
Objective

Is it economically feasible to convert agricultural land into forest?

- The aim was to estimate the breakeven-price (BEP) of REDD+ credits for different crops cultivated in Ghana
- and thereby determine whether forest-projects can provide sufficient economic incentives
- and in that way achieve emissions reductions from tropical forest deforestation and degradation.

- Or in other words – how much should you minimum pay a farmer to grow forest on 1 ha of his agricultural land?

Overview


Background information
Knowledge of Ghana and Kade
To assess the carbon sequestration potential of the land the carbon content in a primary forest was measured and estimated by using allometric equations.
Opportunity costs are the expenditures necessary to compensate landowners for the value of the activity on their land.
Potential carbon density in plantations
Potential carbon density in primary forest
Opportunity costs of agriculture
Carbon content of four different plantation types (cocoa, oil palm, rubber and orange) was measured to assess the consequences of converting to plantations.
Breakeven price of REDD-credits
BEP = OC / PCD
Potential of REDD+ in Ghana

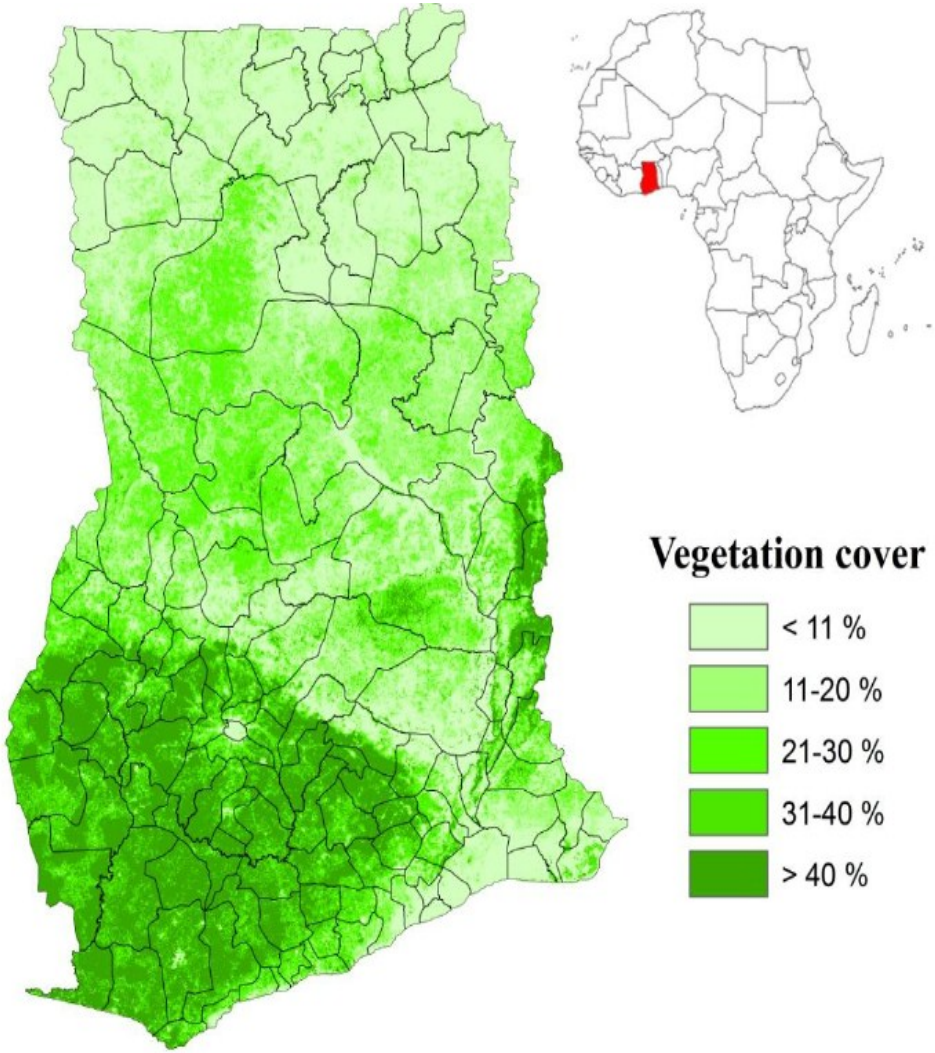


Figure 2: MODIS Vegetation Continuous Field of Ghana 2005 (processed by authors).

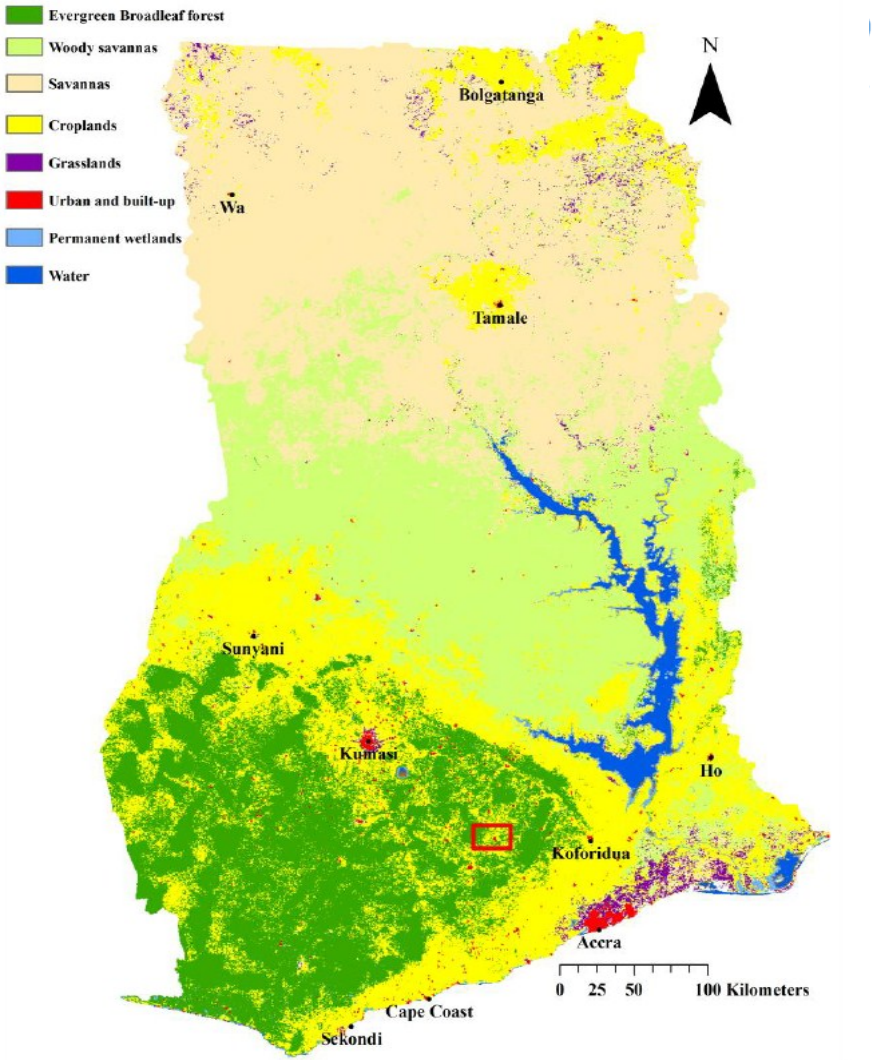


Figure 4: MODIS MCD12Q1 yearly land cover type 2008 (500m) from NASA (processed by authors). The red square indicates the area of interest that is enlarged in Figure 5.

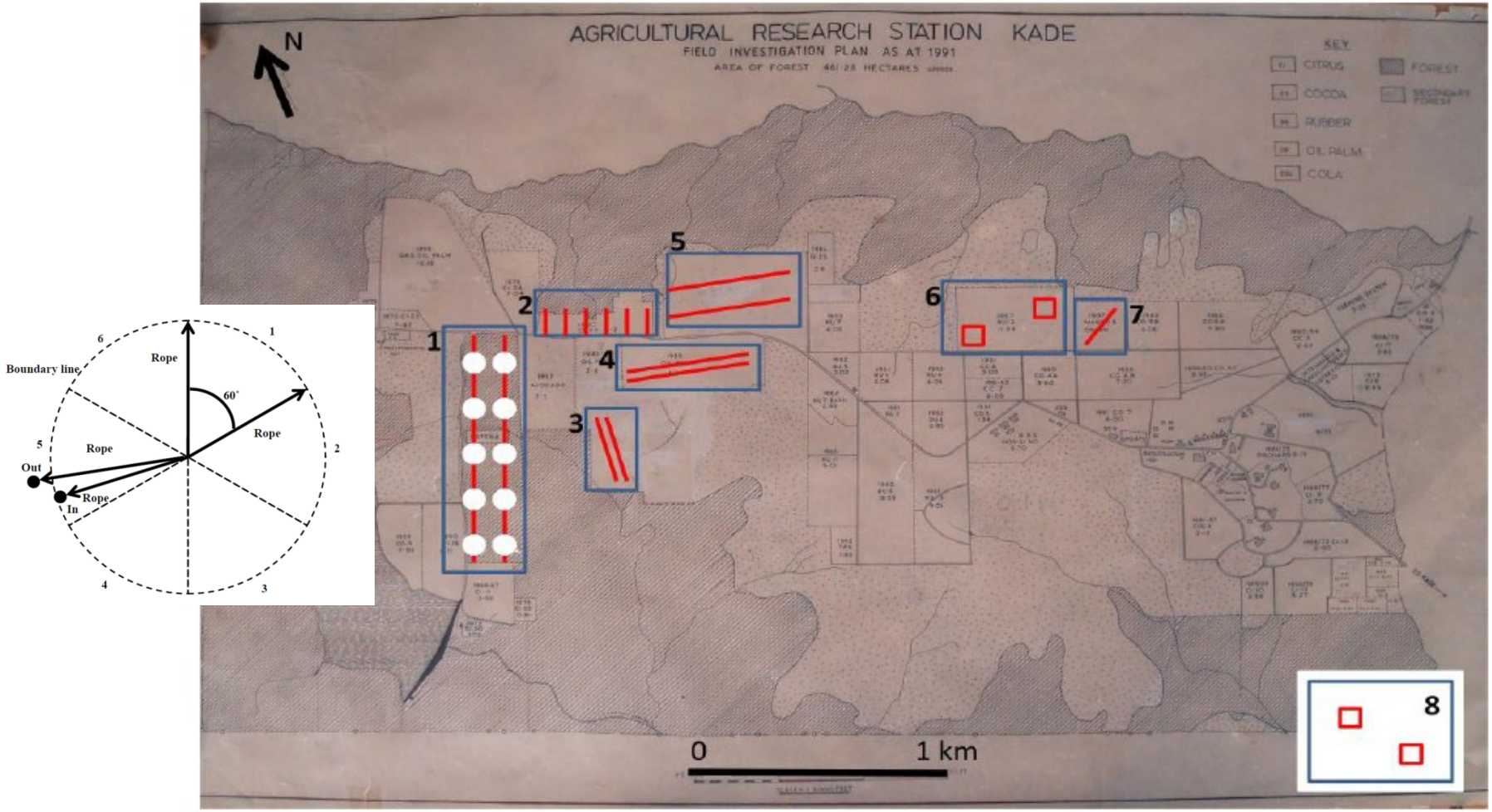


Figure 6: Map of ARC-Kade. 1: Primary forest (> 100 years). 2: Orange plantation (15 years). 3: Oil palm plantation (16 years). 4: Oil palm plantation (23 years). 5: Oil palm plantation (7 years) 6: Rubber plantation (44 years). 7: Cacao plantation (21 years). 8: Rubber plantation (12 years) 25 km south of Kade. Red lines indicate transects, white circles indicate primary forest plots, and red squares in 6 and 8 indicate rubber plots.

Opportunity Costs

- The OC of agriculture were calculated as a sum of the annual net revenue (NR) stream from agricultural production over 30 years, plus the net present value (NPV).
- NR was estimated by total revenue per hectare minus production costs per hectare of a cultivated patch of land. The costs of the agricultural activity itself such as labor and input costs, was taken into account. The prices and yields for Ghana were obtained from FAOSTAT since these figures were not possible to obtain from the interviews. A five year average (2004-08) was used to avoid a too powerful influence of annual fluctuations – the numbers from 2008 was the latest. Estimates of labor and other farming costs were based on the interviews and observations in the fields, nevertheless, some assumptions were applied to conduct the BEP analysis. These factors were then used to estimate the NR per hectare a Ghanaian farmer should expect for the crops. Equations from Bellassen and Gitz (2008:339) and Silva-Chávez (2005:83) were modified to the equation below:
- where Y is the yield, P it producer price and I is input costs including fuel use, fertilizer, pesticide, seeds and so forth. L is individual labor i.e. how much the farmer would get from a similar activity since they do not pay themselves for farming.
- where NPV is the discounted net present value, N is the number of years, NR_i is the net revenue in year *i* and $\propto$ is the discounting rate.

$$OC = NR + NPV$$

$$NR = Y * P - (I + L)$$

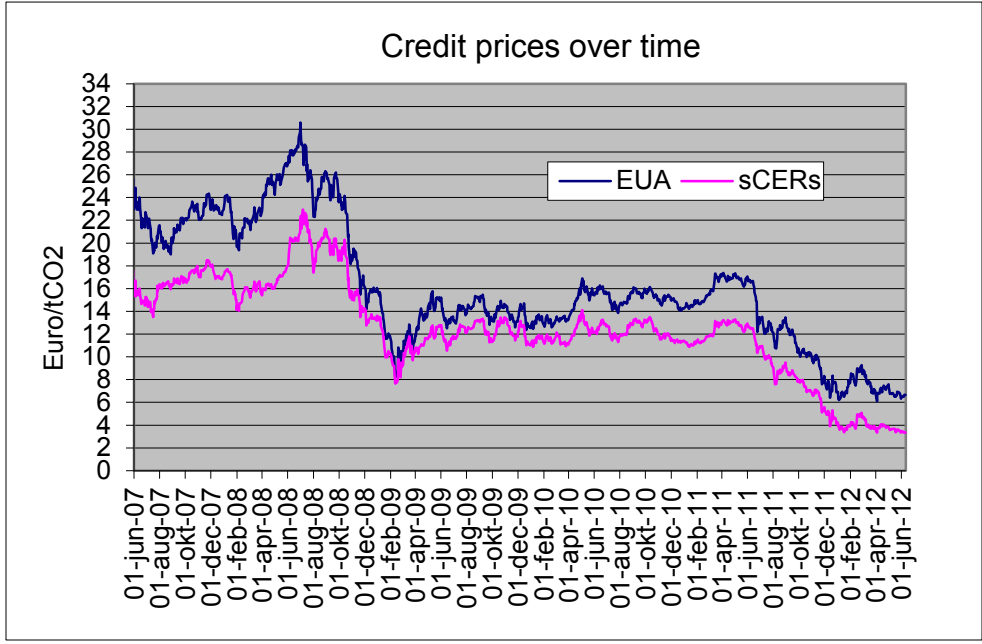
$$NPV = \sum_{i=1}^{N} \frac{NR_i}{(1+\propto)^i}$$

Breakeven Price

- The BEP in this case is the threshold value of carbon credits that is illustrating the most economical land-use form between farming and forest-projects.
- BEP = Opportunity Costs / Potential Carbon Density (173.3 tC/ha)

	Cassava	**Plantain**	**Maize**	**Cocoa**	**Oil palm**
Y (average 2004-08 yield in t/ha)	12.7 ±0.5	9.8 ±0.9	1.6 ±0.1	0.4 ±0.0	6.0 ±0.3
P (producer price average 2004-08 in US$/t)	123.4 ±23.4	344.4 ±80.0	318.5 ±87.0	1022.3 ±66.7	52.9 ±10.7
Value of intercropping the first years (US$/ha)				2284 (2 years)	3427 (3years)
Starts producing after (years)	0	0	0	8	3
C (cultivation time in years)	2	2	2	20	22
F (fallow time in years)	3	3	3	3	3
I (input costs in US$/ha/year)	50	50	50	50	50
L (labour costs in US$/ha/year)	142	142	142	142	142
NR (net revenue in US$/ha) 1 year	1380	3189	313	216	125
NPV (net present value in US$/ha) (30 years) with 10% discounting	7335	16953	1378	3054	3921
BEP (break even price in US$/tC)	42.3	97.8	8.0	17.6	22.6
BEP (break even price in US$/tCO2)	**11.5**	**26.7**	**2.2**	**4.8**	**6.2**

Summary: BEP



- **Comparison**
  - **Our estimate: Average: 10.3 US$/tCO2**
  - **CER EU ETS ~4.20 US$/tCO2 (12 June 2012)**
  - **Osafo (2005) and Silva-Chavez (2005)**

- **Uncertainty**
  - **Yield**
  - **Producer price**
    - **In general are crop prices increasing**
    - **Future fluctuations caused by internal and external changes**
    - **Market prices contra gate prices. Subsistence crops**
  - **Input costs**
  - **Labor costs**
    - **It was assumed that they can get a job**
    - **Informal sector (Number 62 of 178 countries in the Transparency International index 2010)**
  - **Permanence**
    - **30 or 50 years (Osafo (2005), Silva-Chavez (2005) contra Steininger (2000))**
    - **The forest has to be protected and managed to reach the 173.3 tC/ha.**
  - **Discount rate**
  - **Inflation**
  - **Transaction costs**
    - **Include the cost of searching for projects and partners, negotiating with partners, as well as monitoring and regulatory approval of projects**
    - **Other costs: Implementation, administrative, and stabilization**

Costs for REDD+

(Boucher 2008)

- Opportunity costs. Opportunity costs are the expenditures necessary to compensate landowners for the value of the most profitable activity on their land, such as logging or agriculture. These expenditures are the largest portion of REDD costs.
- Implementation costs. Implementation costs refer to the increased planning and land management expenses a government needs to put REDD into practice.
- Administrative costs. Administrative costs are the operational expenses of administering REDD programs.
- Transaction costs. Transaction costs include the cost of searching for projects and partners, negotiating with partners, as well as monitoring and regulatory approval of projects.
- Stabilization costs. Another important part of REDD is stabilization, or the need to prevent deforestation from moving to non-participating countries. Stabilization seeks to prevent this international leakage.

Conclusions

- Several uncertainties, but comparable to similar studies
- Our analysis showed that Ghana would clearly benefit from implementing REDD+
- Economically vs. co-benefits
- Potential in plantations (REDD++)
- Challenges
  - Smallholders / large landholders
  - The tenure rights system
  - Valuation of land
- Estimates mainly clarified whether it could be financially worthwhile to establish AR-projects in Ghana

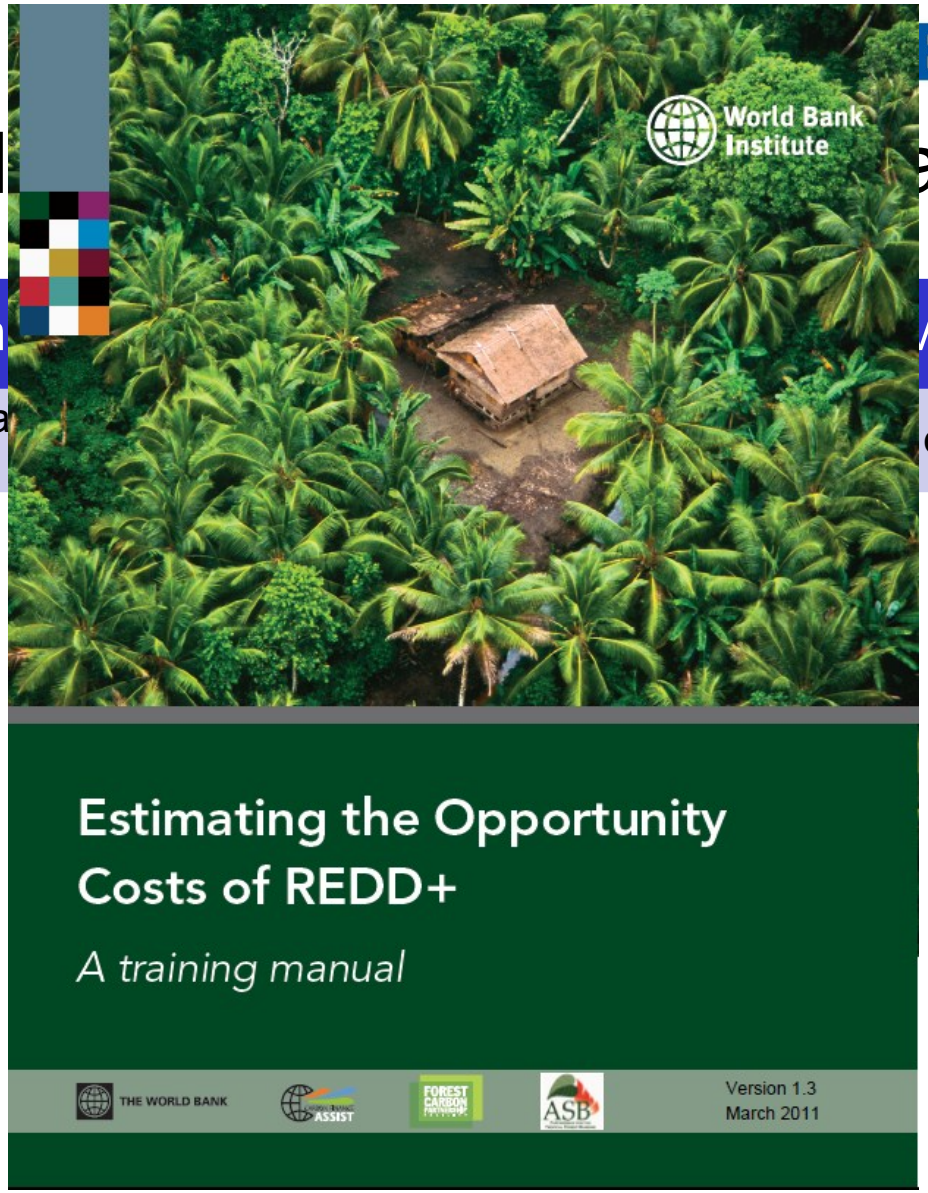
Publications

Peer-reviewed articles

- Kongsager, R., Napier, J. & Mertz, O. (2012). The breakeven price of REDD-credits: a case study from Kade, Ghana. Manuscript submitted to “Environmental Management”. Status: Accepted with changes.
- Kongsager, R., Napier, J. & Mertz, O. (2012). The Carbon Sequestration Potential of Plantations: a case study from Kade, Ghana. Manuscript submitted to “Mitigation and Adaptation Strategies for Global Change”. Status: Under review.

Forest and

Research	Methods
Risk assessment of forest a Costa Rica in regard to	quantitative databases



Thank you for your attention…

Figure 7: DBH measurement in the primary forest.

Rico Kongsager
PhD Candidate
UNEP Risoe Centre on Energy, Climate and Sustainable Development (URC)
www.uneprisoe.org

Direct: +45 46775192
Mobile: +45 61690468
Skype: rico.kongsager
Email: rick@dtu.dk